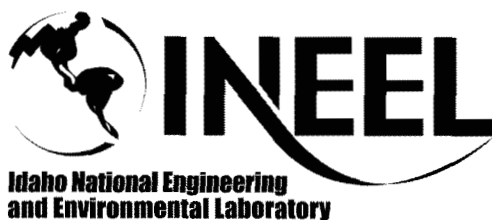


Engineering Design File

PROJECT NO.22091

Potential Feed Streams for Inclusion into V-Tank Treatment Process



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ENGINEERING DESIGN FILE

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5. Summary: The treatment for the V-Tank waste is designated as chemical oxidation followed by stabilization. An additional nine waste streams were considered for inclusion with the V-Tank waste due to common characterization data, waste form, or lineage to the V-Tank waste. Four of these waste streams were chosen for consolidation with the V-Tank waste. These four waste streams are: ARA-16, unaltered V-Tank samples, OU 1-07B, and liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9. The purpose of this Engineering Design File (EDF) is to supply data for these waste streams and calculate a composite feed. The composite feed data will be used to evaluate potential impacts to the current V-tank baseline, such as process design (treatment and off-gas systems), safety, etc. This EDF provides a summary table showing the overall composite of the feed stream to be treated. In order to generate this table, there was no inclusion of additional waters that would be needed to remove these wastes from their containers. This was done to provide worst-case concentrations for the composite feed.				
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Potential Feed Streams for Inclusion into V-Tank Treatment Process

1. INTRODUCTION

The treatment for the V-Tank waste is designated as chemical oxidation followed by stabilization. The contents of all four V-Tanks consists roughly of an 8 to 10% by weight slurry that requires treatment (per RCRA guidelines) for F001 halogenated hydrocarbons, such as trichloroethylene (TCE), perchloroethylene (PCE)^a, and 1,1,1-trichloroethane (TCA). It may be necessary to also treat additional organics such as Aroclor-1260 and bis (2-ethylhexyl) phthalate, pending additional characterization analysis and negotiations with State/EPA Region authorities. A treatment system obtained from Oak Ridge National Laboratory will be used to perform chemical oxidation by use of Fenton's Reagent. An additional nine waste streams are considered for inclusion with the V-Tank waste due to common characterization data, waste form, or lineage to the V-Tank waste. The purpose of this Engineering Design File (EDF) is to supply data for these waste streams to be used to evaluate potential impacts to the current V-tank baseline, such as process design (treatment and off-gas systems), safety, etc. The radiological data used to calculate the composite waste stream concentrations in Appendix A are based on "as-reported" values and did not allow for radiological decay. Safety analyses based on the overall radiological source term data can use individual radiological datasets provided in this EDF to perform calculations that will account for radiological decay (using the appropriate software packages). It is assumed that the composite radiological concentrations in Appendix A provide a bounding condition.

2. TREATMENT OF V-TANK WASTE

The treatment that was selected for the V-Tank waste is based on the characterization of this waste. The characteristic information on the V-Tanks waste itself is presented in EDF-3868, "V-Tank Analytical Data-Calculated Averages and Upper Confidence Limits." The toxicity characteristic leaching procedure (TCLP) analyses for metals indicate that there are no D-codes due to metal contamination. The V-Tank waste has the following organic contaminant of concerns (COCs): trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1,1-trichloroethane (TCA), bis (2-ethylhexyl) phthalate (BEHP), and Aroclor-1260. Table 1 shows these contaminants.

Table 1. Organic contaminants of concern.

Organic	Average (mg/kg)	95% UCL (mg/kg)
TCE	426	1090
PCE	118	235
TCA	52	122
BEHP	454	552
Aroclor-1260	18	21

a. Also known as tetrachloroethylene.

Table 1 contains the main treatment goals for the V-tank project.^b The main radionuclides are listed in Table 2.

Table 2. Key radionuclides in the V-tank.

Radionuclide	Average (nCi/g)	95% UCL (nCi/g)
Cs-137	988	1190
Sr-90	1840	2540
TRU	4.28	5.54

Any waste stream that is to be consolidated with the V-Tank waste should be compatible with respect to the matrix and contaminants to be treated. For consolidation with the V-Tank waste, candidate waste streams should:

- Not be characteristic with respect to metals
- Not be characteristic with respect to organics – may exceed the regulatory TCLP concentration for only TCE or PCE
- Should not be characteristic due to corrosivity (acidic or caustic).

The next section will discuss the various candidate waste streams for consolidation.

3. IDENTIFICATION OF CANDIDATE WASTE STREAMS

As mentioned in theSection 1, the nine waste streams that are considered for inclusion into the V-Tank treatment system are shown in Table 3. Each one will be presented in more detail in this section. Of these waste streams only four of them are considered for direct consolidation with the V-Tank contents. These specific waste streams are: ARA-16, unaltered V-tank samples, OU 1-07B, and liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9. If the remaining waste streams from Table 3 are treated in the V-Tank treatment system, they will not be treated with the V-Tank contents.

b. There are issues with whether or not the V-Tanks are considered as an F001 waste versus a combined F001/D039. If the V-Tank waste is only F001, BEHP and Aroclor-1260 will not require destruction. If the V-Tanks are the combined F001/D039, all the constituents in Table 1 will require destruction.

Table 3. Miscellaneous Streams for consideration to include in V-Tank treatment system.

Waste Stream	Volume	Adjusted Volume (gal)	Rationale for Inclusion into V-Tank Treatment Unit
ARA 16	80 gal	380	Agency agreement Waste stream similarity No designated treatment process Will be consolidated with V-tank contents
Unaltered V-Tank samples	<50 gal	50	Return of V-Tank samples to point of origin Will be consolidated with V-tank contents
Altered V-Tank samples	~75 gal	75	Return to source of generation Consolidation of all 848 samples and characterize as one lot
OU 1-07B sludges	4 gal	15	CERCLA waste that originated from the V-Tanks prior to injection well discharge and subsequent retrieval Will be consolidated with V-tank contents
PM-2A Feed lines liquids	2 drums	100	Return to source of generation – feedlines to PM-2A were discharged from V-Tanks May be incompatible with PM2A treatment due to regulatory considerations
Liquids removed from piping from VP#1 to VP#2	5 drums	250	Waste was in V-Tank feedlines
Liquids removed from piping from Decon shop to VP#2	3 drums	150	Waste was in V-Tank feedlines
Liquids removed from decon of Decon shop	3 drums	150	Waste was in V-Tank feedlines
Liquids removed from isolating piping from TAN-616 to V1, V2, V3, V9.	3 carboys (5-gal) 1 Drum (30-gal)	20	Waste was in V-Tank feedlines Will be consolidated with V-tank contents

3.1 ARA-16 Waste

The Auxiliary Reactor Area (ARA)-I Radionuclide Tank (ARA-16) received liquid waste, including wash water from the ARA-I hot cells, and methanol, acetone, chlorinated paraffin, and mixed acids from materials testing and research and metal-etching processes. The ARA-16 remedial action was initiated in fiscal year (FY) 2000. Piping leading to the tank was rinsed to the extent practicable with any remaining free liquids allowed to drain into the tank. The rinsing activities contributed an additional estimated 1,136 to 1,514 L (300 to 400 gal) of liquid waste to the approximate 1,136 L (300 gal) of sludge and liquid already in the tank. The tank contents were subsequently removed by pumping approximately 1,514 L (400 gal) of the contents into a high-density polyethylene (HDPE) high-integrity container (HIC) outfitted with dewatering internals. The dewatering internals consisted of perforated polyvinyl chloride (PVC) piping covered with a pleated paper filter media. The waste that was pumped into the HIC was allowed to stand overnight with the solid material settling below the dewatering internals, allowing the

liquid to be pumped out through the filters into drums where it was stabilized for disposal. This sequence was repeated until all of the contents of the ARA-16 tank were removed and the tank had been rinsed repeatedly to allow for final removal and disposal of the tank. The HIC currently contains approximately 300 L (80 gal) of sludge and liquid, of which it is estimated that 17 L (4.5 gal) is sludge with the remaining 290 L (75.5 gal) being liquid. By visual examination, this figure conservatively overestimates the actual volume of the sludge. Before any of the remediation activities, the tank contents were sampled with both the sludge and the liquid phases analyzed for numerous contaminants. From the analysis, the waste was given the codes of F001 and F005. Table 4 provides the F001 treatment standards as the waste currently sits in storage. Table 5 and Table 6 provide further characterization information on this waste. In order to remove the sludge from its current container, 300 gal of spray water are expected.

EDF-4779, "ARA-16 Sludge Characteristics Determination" provides waste characterization for the ARA-16 waste. This EDF provided TCLP data to determine that no D-codes apply to the waste. Of the waste streams that are planned for inclusion in the V-Tank system, this is the only one that is included solely on characterization data and not on a lineage to the V-Tank/PM-2A Tank system. This waste meets the three criteria for consolidation. The current plan is to add this waste to the consolidation tank and mix with the V-Tank contents.

3.2 V-Tanks Unaltered Samples

This waste stream consists of the unaltered samples of V-Tank waste. There is less than 50 gal of these samples (<0.42% of the existing waste). As stated previously, the characteristic information on the V-Tanks waste itself is presented in EDF-3868, "V-Tank Analytical Data-Calculated Averages and Upper Confidence Limits." It is inherently assumed that this information holds for these samples – so long as the ratio of sludge to supernatant is similar to the actual V-Tanks. The current plan is to add this waste to the Consolidation Tank and mix with the V-Tank contents.

Table 4. F001 treatment scenario for ARA-16 waste.

F001 Constituent	Treatment Standard, (mg/L)	Concentration, (mg/L)	
1,1,1-Trichloroethane	6	1.41E+03	Need to treat for this constituent
Trichloroethene	6	2.79E+02	Need to treat for this constituent
Toluene	10	1.22E+01	Need to treat for this constituent (if F001 is applicable to this one)
1,1,2-Trichloroethane	6	2.87E-01	
Tetrachloroethene	6	5.19E-01	
Ethylbenzene	10	3.03E-01	
Total Xylenes	30	1.66E+00	

Table 5. Miscellaneous data on the ARA-16 waste.

Analysis-	Liquid	Liquid	Sludge	Sludge
pH	7.70	7.59	7.11	7.01
Reactive Cyanide (mg/L or mg/kg)	0.009	0.011	0.990	0.8
Reactive Sulfide (mg/L or mg/kg)	<1	<1	<25	<25
Total Sulfate (mg/L or mg/kg)	149	147	NR	NR
TSS (mg/L)	7.0	7.0	NR	NR
Density (g/mL)	0.998	0.990	NR	NR
Flash Point (deg F)	NR	NR	>150	>150
Moisture Content (%)	NR	NR	86.2	81.0
Bulk Density (g/mL)	NR	NR	1.21	1.160
Hardness (mg/L)	110	120	NR	NR
Oil and Grease (mg/L or mg/kg)	14.1	13.7	NR	NR
TOX (ug/L)	13,900	15,800	3,229	3,344
TOC (mg/L or mg/kg)	49.5	47.9	43,150	45,500

Table 6. Full Characterization of ARA-16.

Analysis-	Liquid Average	Sludge Average	Overall (both phases)
Metals	(mg/L)	(mg/kg)	(mg/kg)
Aluminum	3.10E-01	2.78E+03	1.83E+02
Antimony	—	1.87E+00	1.94E-01
Arsenic	1.37E-02	—	6.21E-02
Barium	2.80E-03	5.30E+01	3.50E+00
Beryllium	2.67E-04	1.49E+00	9.88E-02
Cadmium	—	4.69E+00	3.12E-01
Calcium	9.54E+00	1.91E+03	1.35E+02
Chromium	1.53E-02	2.29E+02	1.51E+01
Cobalt	—	2.44E+00	1.62E-01
Copper	1.73E-01	1.01E+02	6.84E+00
Iron	1.72E-01	6.85E+03	4.52E+02
Lead	2.23E-02	6.65E+02	4.39E+01
Magnesium	2.66E+01	9.20E+02	8.55E+01
Manganese	7.40E-03	3.19E+01	2.11E+00
Mercury	5.10E-04	5.23E-01	3.50E-02
Nickel	1.42E-01	6.36E+01	4.33E+00
Potassium	1.43E+01	3.77E+02	3.82E+01
Selenium	—	8.80E-01	5.92E-02

Table 6. (continued).

Analysis-	Liquid Average	Sludge Average	Overall (both phases)
Silver	2.55E-02	1.30E+02	8.62E+00
Sodium	2.47E+02	7.41E+02	2.79E+2
Thallium	—	4.70E-02	3.47E-3
Vanadium	1.05E-02	2.52E+01	6.67E+00
Zinc	5.08E-02	1.50E+02	9.92E+00
Sulfur	—	6.52E+02	4.30E+01
Anions	(mg/L)	(mg/kg)	(mg/kg)
Fluoride	1.37E+00	3.43E+01	3.54E+00
Chloride	2.18E+02	1.66E+03	3.13E+02
Bromide	3.67E-01	—	3.42E-01
Nitrate	—	1.17E+01	8.65E-01
Phosphate	1.11E+02	1.05E+03	1.73E+02
Sulfate	9.95E+01	5.81E+02	1.31E+02
VOCs	(mg/L)	(mg/kg)	(mg/kg)
1,1-Dichloroethene	1.90E-01	4.60E+01	3.21E+00
trans-1,2-Dichloroethene	7.00E-03	—	1.59E+00
1,1-Dichloroethane	3.60E-01	8.30E+00	8.84E-01
cis-1,2-Dichloroethene	5.30E-02	1.30E+00	1.35E-01
1,1,1-Trichloroethane	6.17E+01	2.05E+04	1.41E+03
Trichloroethene	1.30E+01	4.05E+03	2.79E+02
Toluene	2.80E-02	1.85E+02	1.22E+01
1,1,2-Trichloroethane	1.10E-01	2.80E+00	2.87E-01
Tetrachloroethene	5.00E-03	7.80E+00	5.19E-01
Ethylbenzene	—	4.60E+00	3.03E-01
m and p-Xylenes	—	1.90E+01	1.25E+00
o-Xylene	—	6.10E+00	4.02E-01
1,1,2,2-Tetrachloroethane	4.30E-02	3.90E+00	2.97E-01
SVOCs	(mg/L)	(mg/kg)	(mg/kg)
Phenol	—	8.60E-01	5.67E-02
2-Methylphenol	—	5.00E-01	3.30E-02
N-Nitroso-di-n-propylamine	—	8.50E-01	5.61E-2
Benzoic Acid	1.00E-03	0.00E+00	9.34E-04
Naphthalene	—	2.00E+00	1.32E-01
4-Chloro-3-methylphenol	—	5.80E-01	3.83E-02
2-Methylnaphthalene	—	2.50E+00	1.65E-01
Phenanthrene	—	2.20E+00	1.45E-01
Di-n-butylphthalate	—	2.23E+02	1.47E+01

Table 6. (continued).

Analysis-	Liquid Average	Sludge Average	Overall (both phases)
bis (2-Ethylhexyl) phthalate	2.50E-02	1.57E+03	1.03E+02
Di-n-octylphthalate	—	3.00E+01	1.98E+00
Benzo[b]fluoranthene	—	4.80E-01	3.17E-02
Dibenz[a,h]anthracene	—	6.00E-01	3.96E-02
PCBs	(mg/L)	(mg/kg)	(mg/kg)
Aroclor-1260	—	7.70E+01	5.08E+00
Cyanide		(mg/kg)	(mg/kg)
Total	1.15E-05	1.58E+01	1.05E+00
Gamma Spec.	(pCi/L)	(pCi/g)	(pCi/g)
Ag-108m	—	4.64E+03	3.06E+02
Co-60	1.74E+04	2.03E+05	1.34E+04
Cs-134	2.05E+05	3.12E+04	2.25E+03
Cs-137	5.92E+07	1.13E+07	7.98E+05
Eu-152	—	2.15E+04	1.42E+03
Eu-154	—	5.82E+03	3.84E+02
Zn-65	—	5.50E+03	3.63E+02
Alpha Isotopes	(pCi/L)	(pCi/g)	(pCi/g)
Pu-238	1.02E+03	2.25E+04	1.49E+03
Pu-239/240	1.55E+03	2.30E+04	1.52E+03
U-234	7.64E+02	3.54E+04	2.34E+03
U-235	4.68E+00	—	1.05E+01
U-238	1.56E+01	4.64E+02	3.06E+01
Am-241	1.76E+03	3.27E+04	2.16E+03
Strontium-90	1.68E+05	5.59E+05	3.71E+04
Tritium	2.94E+05	—	2.75E+02

3.3 V-Tanks Altered Samples

These are samples that were returned to the INEEL from outside laboratories that have provided services for characterization. There are 848 samples of altered V-Tanks samples. There is very limited data on these samples – basically enveloped values are assigned to these wastes. The Waste Generator Service (WGS) organization is working on consolidation of these samples. After consolidation, WGS plans on sampling the waste for characterization. The estimated volume of altered V-Tank samples is 75 gal. Alterations to these samples to accommodate given analyses could place waste codes on the waste (e.g. acid digestate solution), and that the matrices, in some cases, could vary drastically from the V-Tank wastes. As a result, these wastes will not be consolidated with the V-Tank wastes. The current plan is to possibly treat this waste in the V-tank treatment system. This waste will **not** be consolidated with the V-tank contents.

3.4 OU 1-07B Sludge (TSF-05)

The OU 1-07B sludge waste was generated in 1997 as part of sludge sampling activities performed in efforts to better characterize the waste material present within the TSF disposal well TSF-05. The sludge was also collected for use in various treatability studies, including bench scale in situ chemical oxidation (ISCO) treatability studies. A number of extra samples were collected in case the planned analysis identified further analyses that could be beneficial in determining the complete characterization of the material. Many of the samples were not used for characterization or the treatability studies and are no longer needed by the project. There are 28 discrete sample vials partially filled with sludge material. The volume of sludge in the sample vials is estimated to be 12 L total. Since the sludge was removed from the contaminated aquifer as part of a CERCLA action, it is CERCLA waste and carries a F001 waste code. These samples have been analyzed for TCLP with results indicating that no other waste codes apply to the sludge material. The major contaminants in the waste are trichloroethene (TCE), tetrachloroethene (PCE), and cis- and trans-dichloroethene (DCE). Other contaminants present in the sludge material include low levels of Sr-90 and Cs-137. Since the TSF-05 injection well received wastes from the TSF waste disposal system (the same system that disposed of waste into the PM-2A Tanks) the sludge material is very similar in composition to the residual material in the PM-2A Tanks. This waste stream is CERCLA waste that originated from the V-Tanks prior to injection well discharge and subsequent retrieval. There is about four gal of this waste present that could be added to the V-Tank treatment process. In order to remove the four gal of waste, an additional 11 gal of water is estimated for removal.

The total metals data for the OU 1-07B sludge are provided in Table 7. The TCLP data provided for the metals indicate that there will be no D-codes relative to metals. The VOC and SVOC data for the OU1-07B sludge are provided in Table 8. Note that Samples 2, 4, and 6 were run as "high dilution" duplicate samples of Samples 1, 3, and 5. The high dilution duplicate runs were run at a dilution factor of 400 whereas the low dilution samples were run at a dilution factor of 5. Due to the concentration values as presented in the low dilution runs, the higher dilution result with the 'U' flag can be dropped. This explanation, as presented in an e-mail correspondence, covers the nature of the organic data and the application of D-codes. There are no D-codes applied to the waste due to organic concentration. Table 9 presents the radiological data for OU 1-07B waste. This waste meets the three criteria for consolidation. The current plan is to add this waste to the consolidation tank and mix with the V-Tank contents.

Table 7. Metals Data for OU 1-07B Sludge.

	Sample 1 (mg/kg)	Sample 2 (mg/kg)	Sample 3 (mg/kg)	Average (mg/kg)
Aluminum	3.04E+03	2.73E+03	2.62E+03	2.80E+03
Antimony	2.30E+00	3.40E+00	2.70E+00	2.80E+00
Arsenic	6.10E+00	9.80E+00	6.80E+00	7.57E+00
Barium	1.26E+02	1.19E+02	1.47E+02	1.31E+02
Beryllium	4.20E-01	4.20E-01	4.50E-01	4.30E-01
Cadmium	6.30E+00	5.90E+00	6.60E+00	6.27E+00
Calcium	2.35E+04	2.20E+04	2.44E+04	2.33E+04

c. E-mail from Lee O. Nelson to David R. Tyson on April 23, 2004.

Table 7. (continued).

	Sample 1 (mg/kg)	Sample 2 (mg/kg)	Sample 3 (mg/kg)	Average (mg/kg)
Chromium	1.38E+02	1.57E+02	1.44E+02	1.46E+02
Cobalt	1.06E+01	2.96E+01	1.17E+01	1.73E+01
Copper	2.30E+02	3.21E+02	3.35E+02	2.95E+02
Iron	3.91E+04	1.10E+05	5.33E+04	6.75E+04
Lead	7.75E+01	7.47E+01	8.92E+01	8.05E+01
Magnesium	3.93E+03	3.71E+03	3.98E+03	3.87E+03
Manganese	2.89E+02	6.49E+02	3.47E+02	4.28E+02
Mercury	3.56E+01	3.08E+01	3.40E+01	3.35E+01
Nickel	5.19E+01	7.04E+01	6.01E+01	6.08E+01
Potassium	3.85E+02	3.52E+02	3.81E+02	3.73E+02
Selenium	1.20E+00	1.70E+00	1.40E+00	1.43E+00
Silver	6.38E+01	8.79E+01	9.89E+01	8.35E+01
Sodium	3.69E+02	3.50E+02	3.16E+02	3.45E+02
Thallium	1.50E+00	1.90E+00	1.10E+00	1.50E+00
Vanadium	1.42E+01	1.30E+01	1.32E+01	1.35E+01
Zinc	9.58E+02	9.16E+02	1.19E+03	1.02E+03

Table 8. Organics (VOC and SVOC) found in OU 1-07B Sludge (units of µg/kg).

	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Sample 6	
1,1,2-Trichloroethane	25	U	25000	U	25	U	250000	U	46		250000	U
1,1-Dichloroethane	20	J	25000	U	21	J	250000	U	17	J	250000	U
1,1-Dichloroethene	1700	E	25000	U	840		2500000	U	1300	E	250000	U
4-Methyl-2-pentanone	23	J	100000	U	17	J	1000000	U	17	J	1000000	U
Acetone	470	B	87000	DJB	220	B	1100000	DB	170	B	1100000	DB
Aroclor-1254	5200		3400		3300							
Aroclor-1260	6000		3600		3200							
Benzene	250		25000	U	230		250000	U	220		250000	U
Carbon disulfide	26		25000	U	23	J	250000	U	56		250000	U
Chlorobenzene	51		25000	U	38		250000	U	44		250000	U
cis-1,2-Dichloroethene	28000	E	370000	D	24000	E	450000	D	29000	E	390000	D
Ethylbenzene	180		25000	U	120		250000	U	120		250000	U

Table 8. (continued).

	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Sample 6	
Methylene chloride	71	B	6900	DJB	65	B	450000	DB	62	B	380000	DB
Styrene	24	J	25000	U	17	J			12	J	250000	U
Tetrachloroethene	29000	E	210000	D	27000	E	250000	U	28000	E	690000	D
Toluene	940		25000	U	370		860000	D	830			
trans-1,2-Dichloroethene	4100	E	5800	DJ	2300	E	250000	U			250000	U
							120000	U	2100	E	120000	U
Trichloroethene	27000	E	560000	DB	25000	E	3900000	DB	29000	E	1200000	DB
Vinyl chloride	1300	E	50000	U	660		500000	U	890		500000	U
Xylene	230		25000	U	180		250000	U	160		250000	U

Table 9. Radiological data from OU 1-07B Sludge (units of pCi/g).

	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Sample 6	
Americium-241	1.08	U	0.505		2.56	U	0.369		0.498		-0.636	U
Cesium-137	5920		6380		8930							
Cobalt-60	809		842		867							
Europium-154	0	U	3.79		4.39							
					1410							
Gross beta	16800		15300		0							
		J		J	3990	J						
Nickel-63	3230		37500		0							
Plutonium-238	3.17		1.92		2.41							
Plutonium-239/240	6.42		6		6.3							
Potassium-40	10.6		9.16		6.75							
Radium-226	0.831	J	0.629	U	0.239	U						
Strontium-90	4220		863									
Thorium-228	0.707		0.692	UJ	1.07							
Thorium-230	0.801		0.899	J	1.16							
Thorium	0.691		0.786	J	1.18							
Tritium	31.1		12.1		31.4		17.6		26.1		15.2	
Uranium-233/234	127		146		556							
Uranium-235	7.98		6.25		4.34		6.64		25.8		4.04	
Uranium-238	2.53		1.77		4.9							

3.5 PM-2A Feed Lines Liquids

The liquid from the PM-2A feed lines are assumed to be very similar to the V-Tank waste since the waste in the feed lines came from the V-Tanks. However, there are no data other than radionuclide concentrations to verify that this waste is indeed similar. The issue with adding this liquid directly to the PM-2A Tanks themselves is the worry that this action might drive additional treatment requirements for PM-2A Tank waste. The amount of the liquid in the feedlines is roughly 100 gallons. Table 10 shows some of the major isotopes in this waste. The current plan is to wait until the rest of the PM-2A feed lines have been removed before formal sampling of this liquid. This will ensure that all of the waste from this source is sampled all at the same time. This course of action assumes that the liquid was going to be returned to the PM-2A Tanks. If the liquid is to be combined with the V-Tank waste, sampling will need to commence immediately. Due to the timing constraints, the current plan is to possibly treat this waste in the V-Tank treatment system. This waste will **not** be consolidated with the V-Tank contents.

Table 10. Radiological data for PM-2A feedlines.

Cobalt-60	3.52E+04	pCi/L
Cesium-137	3.50E+07	pCi/L
Alpha	1.39E+04	pCi/L
Beta	3.29E+07	pCi/L

3.6 Liquids Removed from Piping (Valve Pit 1 to Valve Pit 2)

This liquid was removed and sampled. There are five drums that total roughly 250 gal of liquid from this line. The radiological data are presented in Table 11. The metal data is in Table 12. The organic data is in Table 13. Since this waste stream does not exhibit a characteristic and the F001 treatment standard is not exceeded, treatment may not be required. The current plan is to possibly treat this waste in the V-tank treatment system, if necessary. This waste will **not** be consolidated with the V-Tank contents.

Table 11. Radiological data from piping (VP1 to VP2) in units of pCi/L.

	Sample 1	Sample 2	Sample 3
Mn-54	-1.57E+00	6.28E+00	3.10E+00
Co-58	-1.43E+01	-1.62E+01	1.33E+01
Co-60	8.19E+02	7.49E+02	-1.00E-03
Zn-65	-1.00E-03	1.77E+01	2.48E+01
Nb-95	7.41E+00	3.53E+00	4.29E+00
Zr-95	-3.02E+00	-1.00E-03	-7.56E+00
Ru-103	-5.55E+01	-4.98E+01	3.69E+01
Ru-106	1.18E+02	-1.26E+02	1.82E+01
Ag-108m	-1.68E+00	-1.00E-03	-1.00E-03
Ag-110m	3.69E+00	-7.92E+00	-1.28E+01
Sb-125	-1.18E+02	-1.35E+02	-2.52E+00

Table 11. (continued).

	Sample 1	Sample 2	Sample 3
Cs-134	-3.96E+00	-2.67E+01	5.70E-01
Cs-137	1.16E+05	1.13E+05	1.06E+05
Ce-144	-1.08E+02	2.72E+02	-1.00E-03
Eu-152	-2.05E+01	-2.27E+01	-8.23E+01
Eu-154	-1.00E-03	-1.00E-03	-1.00E-03
Eu-155	-1.00E+02	-4.56E+01	-1.23E+02
Ra-226	1.33E+01	9.14E+01	9.19E+01
U-235	-1.00E-03	-1.00E-03	-1.00E-03
Am-241	1.51E+02	3.98E+01	1.57E+02
Fe-55	2.13E+01	2.08E+01	4.04E+01
Ni-63	6.24E+04	6.73E+04	6.00E+04
H-3	8.67E+06	9.39E+06	9.32E+06
Sr-90	1.06E+06	1.33E+06	1.23E+06
G. Alpha	5.99E+02	5.48E+02	5.16E+02
G. Beta	2.49E+06	3.21E+06	3.08E+06

Table 12. Metal data from piping (VP1 to VP2).

Field Id #:	TSF225017X		TSF22601V6		TSF22602V6	
Target Metal:	(ug/L)	Flags	(ug/L)	Flags	(ug/L)	Flags
Antimony	35.7	B	33.3	B	28.2	U
Arsenic	29.4	B	18.1	B	11.9	U
Barium	92.8	B	103	B	127	B
Chromium	279	J	246	J	256	J
Lead	974	J	800	J	827	J
Mercury	4.36		0.72	J	2.17	B
Nickel	97.0	B	104	B	110	B
Vanadium	3.67	U	7.00	B	9.89	B
Zinc	4020	R	7130	R	12100	R

Table 13. Organic data from piping (VP1 to VP2).

Field Id #:	TSF225017X		TSF22601V6		TSF22602V6	
Target Organic:	(ug/L)	Flags	(ug/L)	Flags	(ug/L)	Flags
Methylene Chloride	1880	J***	10.0	R	10.0	R
Acetone	790	UJ	158	J***	170	J***
2-Butanone	465	UJ	232	J***	217	J***
Benzene	200	UJ	17.9	J	7.0	J
n-Butanol	2000	R	13.6	J	10.0	R
Toluene	200	UJ	4.2	J	2.7	J
4-Methyl-2-pentanone	200	U	10.0	R	1.9	J
Phenol	15.8		12.6		10.6	U
2-Methylphenol	10.5	U	1.8	J	10.6	U
4-Methylphenol	1.2	J	11.0	U	10.6	U
Acenaphthylene	10.5	U	1.3	J	10.6	U
bis(2-ethylhexyl) phthalate	1.4	J	2480	D	2400	D
Acetophenone	2.2	J	2.3	J	10.6	U
3-Methyl Phenol	1.2	J	11.0	U	10.6	U
Phthalic Acid	7.3	J	10.3	J	14.3	J
Phthalic anhydride	7.3	J	10.3	J	14.3	J

3.7 Liquids Removed from Piping (Decon Shop to Valve Pit 2)

This liquid was removed and sampled. There are three drums that total roughly 150 gal of liquid from this line. The radiological data are presented in Table 14. The metal data is in Table 15. The organic data is in Table 16. The pH of this liquid is around 13.^d In addition, the waste may be characteristic for lead (based on rejected sample results). Methylene chloride, acetone, toluene, ethyl benzene are all above their universal treatment standard concentrations. The current plan is to possibly treat this waste in the V-Tank treatment system. Due to the high pH (D003 code), this waste will **not** be consolidated with the V-Tank contents.

d. Conversation between Dave Tyson and Tracy Elder on May 3, 2004.

Table 14. Radiological data from piping (Decon Shop to VP2) in units of pCi/g.

	Sample 1	Sample 2
Mn-54	8.94E-02	1.57E-01
Co-58	4.69E-02	5.65E-02
Co-60	7.58E+01	6.02E+01
Zn-65	-3.31E-02	-5.83E-02
Nb-95	-1.85E-01	1.27E-01
Zr-95	6.10E-01	5.54E-01
Ru-103	-5.37E-01	-6.96E-01
Ru-106	-5.28E+00	-2.30E+00
Ag-108m	-1.00E-03	-1.00E-03
Ag-110m	-2.06E-01	-5.16E-01
Sb-125	-8.86E-01	-2.92E+00
Cs-134	-9.22E-02	1.23E-01
Cs-137	4.61E+03	4.09E+03
Ce-144	-1.00E-03	-3.03E+00
Eu-152	2.39E+00	3.20E+00
Eu-154	8.28E+00	7.55E+00
Eu-155	-9.02E-01	-1.88E+00
Ra-226	2.17E-01	-1.15E-01
U-235	-1.00E-03	-1.00E-03
Am-241	1.07E+01	3.33E+00
Fe-55	-6.39E-01	3.18E+00
Ni-63	8.66E+02	4.69E+02
H-3	1.49E+02	1.61E+02
Sr-90	3.54E+03	3.33E+03
Cm-242	1.04E-02	-3.41E-02
Cm-244	5.92E-01	4.79E-01
G. Alpha	3.97E+01	3.11E+01
G. Beta	1.28E+04	8.39E+03

Table 15. Metals data from piping (Decon Shop to VP2).

Field Id #:	TSF21101		TSF20801VE		TSF20901VA	
Target Metal:	mg/kg	Flags	ug/L	Flags	ug/L	Flags
Antimony	17.1		1490	J	857	J
Arsenic	42.1		190	R	211	R
Barium	10.8	BJ	1820	J	1950	J
Cadmium	19.3	J	306	J	320	J
Chromium	11600	R	147	R	944	R

Table 15. (continued).

Field Id #:	TSF21101		TSF20801VE		TSF20901VA	
Target Metal:	mg/kg	Flags	ug/L	Flags	ug/L	Flags
Cobalt	75.5	R	153	R	127	R
Copper	123	R	325	J	331	J
Lead	638		16300	R	15800	R
Mercury	25.8	R	4	UJ	13.2	
Nickel	6090	R	971	J	1010	J
Selenium	4.94	U	50.4	R	113	R
Silver	0.96	UJ	46	R	9.8	R
Thallium	51.7	J	86.6	UJ	107	J
Tin	32.9	B	34.6	R	34.6	R
Vanadium	23.9	BJ	48.4	R	36	R
Zinc	7350		6,210,000		1,810,000	

Table 16. Organic data from piping (Decon Shop to VP2).

Field Id #:	TSF21101		TSF20801VE		TSF20901VA	
Target Organic:	(ug/Kg)	Flags	(ug/Kg)	Flags	(ug/Kg)	Flags
Methylene Chloride	25.9	R	139,000	DJ***	7,990	DJ***
Acetone	25.9	R	520,000	DJ***	32,100	DJ***
Toluene	82.1	J	82,200	U	3,980	U
Ethylbenzene	18.2	J	82,200	U	3,980	U
Phenol	1280	UJ	1390		1340	
2-Methylphenol	1280	UJ	61.2	J	54.5	J
4-Methylphenol	142	J	644		584	
2,4-Dimethylphenol	1280	UJ	128		124	
4-Chloro-3-Methyl Phenol	1280	UJ	100	U	58.2	J
Acenaphthene	1280	U	10.9	J	100	U
2,4-Dinitrophenol	1280	UJ	10.5	J	100	UJ
Pentachlorophenol	1280	R	100	U	12.7	J
bis(2-ethylhexyl) phthalate	1280	U	15.6	J	58.1	J
Di-n-octylphthalate	1280	U	12.2	J	100	U
3-Methyl Phenol	146	J	663		601	
2,3,4,6-Tetrachlorophenol	1280	UJ	23.2	J	100	U
Phthalic Acid	1280	R	100	UJ	59.1	J
Phthalic anhydride	1280	R	100	UJ	59.1	J

3.8 Liquids from Decontamination of the Decon Shop

This liquid was removed and sampled. There are three drums that total roughly 150 gal of liquid from this line. The radiological data are presented in Table 17. The metal data is in Table 18. The organic data is in Table 19. From TCLP data on the metals, this waste is characteristic for lead. As a result, the current plan is to possibly treat this waste in the V-Tank treatment system. This waste will **not** be consolidated with the V-Tank contents.

Table 17. Radiological data from decon of Decon shop, in units of pCi/L.

	Sample 1	Sample 2	Sample 3
Mn-54	3.43E+00	-4.92E+00	4.97E+00
Co-58	-5.63E+00	-9.22E-01	-1.33E+01
Co-60	1.15E+03	1.06E+03	1.15E+03
Zn-65	0.00E+00	1.77E+00	-1.00E-03
Nb-95	-1.41E+00	3.24E-01	7.08E+00
Zr-95	1.25E+01	2.60E+01	-1.00E-03
Ru-103	-4.56E+00	9.81E-01	-6.29E+01
Ru-106	-2.62E+01	-4.27E+01	-1.06E+02
Ag-108m	-1.00E-03	-1.00E-03	-1.00E-03
Ag-110m	-8.16E-01	-3.39E-01	8.32E+00
Sb-125	-1.00E-03	-6.42E+00	-1.00E-03
Cs-134	8.66E-01	6.22E+00	-6.46E+00
Cs-137	3.15E+04	3.08E+04	3.11E+04
Ce-144	8.48E+00	2.61E+01	-6.96E+01
Eu-152	9.12E+01	7.81E+01	1.06E+02
Eu-154	2.07E+02	2.04E+02	2.24E+02
Eu-155	-1.00E-03	7.22E+01	1.18E+02
Ra-226	2.34E+01	2.11E+01	-1.39E+02
U-235	2.44E+01	-1.00E-03	-1.00E-03
Am-241	5.12E+02	4.42E+02	5.46E+02
Fe-55	5.28E+01	4.75E+01	5.02E+01
Ni-63	5.88E+03	5.32E+03	5.45E+03
H-3	9.14E+02	2.48E+03	2.78E+03
Sr-90	5.10E+04	4.69E+04	4.59E+04
Cm-242	6.29E-01	9.47E-01	1.00E+00
Cm-244	6.89E+01	6.53E+01	7.45E+01
G. Alpha	1.44E+03	1.24E+03	1.38E+03
G. Beta	6.15E+04	1.45E+05	3.92E+04

Table 18. Metals data from decon of Decon shop.

Field Id #:	TSF22701VE		TSF22801VA		TSF22802VA	
Target Metal:	(ug/L)	Flags	(ug/L)	Flags	(ug/L)	Flags
Arsenic	15.7		11.9	U	11.9	U
Barium	38.6	B	34.4	B	37.3	B
Cadmium	71.8		77.9		80	
Chromium	102		85.2		91.9	
Cobalt	718		777		809	
Copper	912	J	973	J	1010	J
Lead	9170		10100		10400	
Mercury	122		124		137	
Nickel	128		120		134	
Zinc	5840		6400		6610	

Table 19. Organic data from decon of Decon shop.

Field Id #:	TSF22701VE		TSF22801VA		TSF22802VA	
Target organic:	(ug/L)	Flags	(ug/L)	Flags	(ug/L)	Flags
Methylene Chloride	825	DJ***	237	DJ***	236	DJ***
Acetone	570	UJ	540	DJ***	499	DJ***
Phenol	14.4		10.9	U	16.8	
2-Methylphenol	50.1		54.3	UD	131	
N-Nitrosodi-n-propylamine	12.2	U	4.8	J	11.1	U
4-Methylphenol	2.3	J	10.9	U	2.5	J
2,4-Dimethylphenol	6.4	J	10.9	U	11.1	U
Diethyl Phthalate	1.5	J	10.9	U	1.4	J
bis(2-ethylhexyl) phthalate	317	D	477	D	264	D
N-Nitrosomorpholine	12.2	U	40.3		11.1	U
3-Methyl Phenol	2.4	J	10.9	U	2.6	J

3.9 Liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9.

This liquid was removed and sampled. There are three 5-gal carboys and one 30-gal drum that total roughly 20 gal of liquid from this line. The three carboys appear to be rinse water or at least a clear aqueous waste. The waste in the 30-gal drum is sludge reading 1R/hr at contact. This waste has not been sampled – the project is deciding whether to sample this waste prior to adding it back to the V-Tanks. For the analysis in this report, it is assumed that the waste in the line is bounded by Tank V-9 content data. This data from Tank V-9 was pulled from EDF-3868, “V-Tank Analytical Data–Calculated Averages and Upper Confidence Limits.” The current plan is to add this waste to the consolidation tank and mix with the V-Tank contents.

4. CONSOLIDATED WASTE STREAM SUMMARY

As mentioned in the introductory paragraph of Section 3, the specific waste streams for consolidation with the V-Tank contents are: ARA-16, unaltered V-Tank samples, OU 1-07B, and liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9. The overall composite is provided in Appendix A. Table 20 provides a glimpse of some of the main components that require consideration when applying treatment. In order to generate these concentrations, additional water needed to remove these wastes from their containers was neglected. As an example, the volume of ARA-16 is 80 gal, but from Table 3, as much as 380 gal of waste could be generated to remove the original 80 gal out of the high integrity container. To maintain a worse case concentration of contaminants for the purpose of calculation, this volume would be calculated at the original 80 gal without consideration for diluting rinses.

Table 20. Concentrations of key components following consolidation.

	V-Tank Contents Concentration (mg/kg)	Additional Waste Concentration (mg/kg)	Composite Waste Concentration (mg/kg)	Percent Change from V-Tank Contents to Composite
Cd	2.34E+00	4.12E+00	2.37E+00	1.0
Chloride	1.06E+02	2.49E+02	1.08E+02	1.8
Hg	7.92E+01	2.57E+02	8.15E+01	2.9
Aroclor-1260	1.80E+01	2.18E+01	1.80E+01	0.3
bis(2-ethylhexyl)phthalate	4.54E+02	2.45E+02	4.51E+02	-0.6
PCE	1.18E+02	1.07E+02	1.18E+02	-0.1
TCA	5.22E+01	9.85E+02	6.43E+01	23.3
TCE	4.26E+02	2.32E+03	4.51E+02	5.8
Toluene	6.10E+00	3.64E+01	6.49E+00	6.5

	V-Tank Contents Concentration (nCi/g)	Additional Waste Concentration (nCi/g)	Composite Waste Concentration (nCi/g)	Percent Change from V-Tank Contents to Composite
Cs-137	9.88E+02	1.34E+03	9.92E+02	0.5
Sr-90	1.84E+03	1.32E+03	1.84E+03	-0.4
Tritium	2.56E+01	3.83E+01	2.58E+01	0.6
TRU	4.28E+00	7.68E+00	4.32E+00	1.0

Table 20 shows tritium values for both the V-tank waste and the additional wastestreams. Calculated tritium values are missing from EDF-3868 "V-Tank Analytical Data--Calculated Averages and Upper Confidence Limits", so a tritium concentration was calculated in this EDF for the V-Tank waste.

5. REFERENCES

EDF-3868, "V-Tank Analytical Data--Calculated Averages and Upper Confidence Limits," Rev. 1,
G. E. Mc Dannel, December 8, 2003.

EDF-4779, "ARA-16 Sludge Characterization Determination," Rev. 0, R. P. Wells, June 21, 2004.

Appendix A

Composite Composition of the Consolidated V-Tank Waste With Other Potential Compatible Waste Streams

Appendix A

Composite Composition of the Consolidated V-Tank Waste With Other Potential Compatible Waste Streams

A.1 DATA SETS USED

In EDF-3868, “V-Tank Analytical Data–Calculated Averages and Upper Confidence Limits”, a composite feed was determined based on the analytical data of the four V-Tanks (two phases each) were determined – complete with averages, standard errors, and degrees of freedom. In this EDF (EDF-4928), a similar approach was used to determine the composite of the V-Tank composite mixed with the following waste streams: ARA-16, unaltered V-Tank samples, OU 1-07B, and liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9.

The exact data utilized from EDF-3868 are the V-Tank average concentrations, standard errors of the concentrations, and degree of freedoms of the composite V-Tank mix. This information will be used for the V-Tank waste and the V-Tank unaltered samples. The average concentrations, standard errors, and the degrees of freedoms from the composition of Tank V-9 will also be used to represent the liquids removed from isolating piping from TAN-616 to V1, V2, V3, and V9. The use of these values is felt to provide a worst-case bounding condition for these liquids.

A.2 CALCULATION PROTOCOL

The data set for the other wastes (ARA-16 and OU 1-07B) were provided by project personnel via spreadsheets. For both data sets, the data exists on the Sample and Analysis Management (SAM) database.

One idiosyncrasy of the database is that for valueless concentrations, an arbitrary degree of freedom was designated (equal to 1). This placeholder value was used to ensure that a “division by zero” error would not occur for the degree of freedom calculation. For ease of calculation, it was assumed that the propagated error resides solely with the concentrations.

Another assumption was to use the original volume of waste. In other words, the volume of ARA-16 is 80 gal, but from Table 3, as much as 380 gal of waste could be generated to remove the original 80 gal out of the high integrity container. To maintain a worse case concentration of contaminants for the purpose of calculation, the volume would be the original 80 gal without consideration for the diluting rinses.

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Constituent	V-Tanks			V-Tanks Samples			ARA-16			OU 1-07B			TAN-616 to V1, V2, V3, V9			Overall		
	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	90% UCL (mg/kg)
Ag	1.84E+01	1.91E+00	5.41E+01	1.84E+01	1.91E+00	5.41E+01	8.62E+00	3.04E+00	2.00E+00	8.35E+01	1.04E+01	2.00E+00	5.22E+02	7.43E+01	1.39E+02	1.92E+01	3.70E+00	2.40E+01
Al	4.83E+02	8.24E+01	2.39E+02	4.83E+02	8.24E+01	2.39E+02	1.83E+02	1.02E+02	2.00E+00	2.80E+03	1.26E+02	2.00E+00	2.69E+03	1.12E+03	2.15E+01	4.86E+02	9.52E+01	6.08E+02
As	3.59E-01	6.31E-02	3.25E+00	3.59E-01	6.31E-02	3.25E+00	6.21E-02	4.05E-03	2.00E+00	7.57E+00	1.13E+00	2.00E+00	3.05E+00	1.58E+00	1.17E+00	3.65E-01	9.47E-02	5.20E-01
B	1.26E+01	5.63E-01	5.75E+00	1.26E+01	5.63E-01	5.75E+00	0.00E+00	0.00E+00	2.00E+00	0	0	1.00E+00	4.35E+01	6.34E+00	8.35E+01	1.26E+01	6.22E-01	1.34E+01
Ba	1.24E+01	3.52E+00	1.25E+00	1.24E+01	3.52E+00	1.25E+00	3.50E+00	2.03E+00	2.00E+00	1.31E+02	8.41E+00	2.00E+00	2.99E+02	1.21E+02	1.30E+00	1.29E+01	6.23E+00	2.46E+01
Be	1.11E+00	1.66E-01	4.57E+00	1.11E+00	1.66E-01	4.57E+00	9.88E-02	6.59E-02	2.00E+00	4.30E-01	1.00E-02	2.00E+00	2.02E-01	2.90E+00	1.35E+02	1.14E+00	2.06E-01	1.42E+00
Bromide	2.96E+00	3.91E-01	8.41E+01	2.96E+00	3.91E-01	8.41E+01	3.42E-01	1.79E-02	1.00E+00	0	0	1.00E+00	9.86E+00	1.40E+00	1.39E+02	2.95E+00	3.94E-01	3.46E+00
Ca	1.23E+03	2.00E+02	2.44E+02	1.23E+03	2.00E+02	2.44E+02	1.35E+02	6.23E+01	2.00E+00	2.33E+04	7.00E+02	2.00E+00	6.74E+03	2.80E+03	2.15E+01	1.24E+03	2.32E+02	1.54E+03
Cd	2.34E+00	3.01E-01	8.08E+00	2.34E+00	3.01E-01	8.08E+00	3.12E-01	1.83E-01	2.00E+00	6.27E+00	2.03E-01	2.00E+00	2.18E+01	4.55E+00	3.34E+00	2.37E+00	3.57E-01	2.85E+00
Chloride	1.06E+02	1.54E+01	1.09E+02	1.06E+02	1.54E+01	1.09E+02	3.13E+02	1.74E+01	1.00E+00	5.00E+00	2.04E+00	2.00E+00	3.97E+02	5.69E+01	1.37E+02	1.08E+02	1.56E+01	1.28E+02
Co	3.01E-01	3.25E-02	7.24E+00	3.01E-01	3.25E-02	7.24E+00	1.62E-01	1.77E-01	2.00E+01	1.73E+01	6.16E+00	2.00E+00	4.03E+00	8.58E-01	3.20E+00	3.13E-01	1.33E-01	5.63E-01
Cr	2.98E+02	5.75E+01	1.59E+02	2.98E+02	5.75E+01	1.59E+02	1.51E+01	7.82E+00	2.00E+00	1.46E+02	5.61E+00	2.00E+00	1.88E+03	7.83E+02	2.15E+01	2.99E+02	6.62E+01	3.84E+02
Cu	1.88E+01	2.39E+00	6.31E+00	1.88E+01	2.39E+00	6.31E+00	6.84E+00	4.72E+00	2.00E+00	2.95E+02	3.29E+01	2.00E+00	3.04E+02	5.98E+01	4.37E+00	1.93E+01	3.56E+00	2.42E+01
Fe	2.67E+03	4.65E+02	2.24E+02	2.67E+03	4.65E+02	2.24E+02	4.52E+02	3.94E+02	2.00E+00	6.75E+04	2.17E+04	2.00E+00	1.46E+04	6.06E+03	2.15E+01	2.70E+03	6.84E+02	3.61E+03
Fluoride	4.85E+00	1.64E+00	1.10E+00	4.85E+00	1.64E+00	1.10E+00	3.54E+00	5.24E-01	1.00E+00	2.90E-01	1.07E-01	2.00E+00	5.27E+00	1.00E+00	5.10E+00	4.84E+00	1.63E+00	9.87E+00
Hg	7.92E+01	6.08E+00	8.94E+01	7.92E+01	6.08E+00	8.94E+01	3.50E-02	2.27E-02	2.00E+00	3.35E+01	1.41E+00	2.00E+00	1.67E+03	2.38E+02	1.39E+02	8.15E+01	1.18E+01	9.67E+01
K	3.56E+02	5.01E+01	2.38E+00	3.56E+02	5.01E+01	2.38E+00	3.82E+01	1.33E+01	2.00E+00	3.73E-02	1.04E+01	2.00E+00	8.54E+03	1.82E+03	3.11E+00	3.69E+02	9.22E+01	5.05E+02
Mg	1.62E+03	2.75E+02	2.23E+02	1.62E+03	2.75E+02	2.23E+02	8.55E+01	3.14E+01	2.00E+00	3.87E+03	8.29E+01	2.00E+00	9.01E+03	3.73E+03	2.15E+01	1.63E+03	3.16E+02	2.03E+03
Mn	7.49E+02	1.31E+02	2.10E+02	7.49E+02	1.31E+02	2.10E+02	2.11E+00	1.79E+00	2.00E+00	4.28E+02	1.12E+02	2.00E+00	4.26E+03	1.77E+03	2.15E+01	7.51E+02	1.51E+02	9.44E+02
Na	2.92E+02	1.52E+01	8.53E+00	2.92E+02	1.52E+01	8.53E+00	2.79E+02	2.31E+01	2.00E+00	3.45E+02	1.55E+01	2.00E+00	1.92E+03	4.02E+02	5.02E+00	2.95E+02	2.29E+01	3.26E+02
Ni	1.64E+01	1.74E+00	9.51E+00	1.64E+01	1.74E+00	9.51E+00	4.33E+00	3.36E+00	2.00E+00	6.08E-01	5.35E+00	2.00E+00	3.19E+02	5.56E+01	8.38E+00	1.69E+01	2.94E+00	2.09E+01
Nitrate	1.55E+00	1.75E-01	5.44E+00	1.55E+00	1.75E-01	5.44E+00	8.65E-01	0.00E+00	1.00E+00	3.77E+01	3.07E+01	2.00E+00	2.85E+01	4.15E+00	1.16E+02	1.60E+00	6.59E-01	2.85E+00
Nitrite	3.84E+00	1.31E+00	1.11E+00	3.84E+00	1.31E+00	1.11E+00	—	—	1.00E+00	1.82E+00	1.25E+00	2.00E+00	2.89E+00	2.86E+00	1.04E+00	3.81E+00	1.31E+00	7.86E+00
P	7.26E+03	1.23E+03	2.33E+02	7.26E+03	1.23E+03	2.33E+02	—	—	2.00E+00	—	—	1.00E+00	4.04E+04	1.68E+04	2.15E+01	7.27E+03	1.42E+03	9.09E+03
Pb	3.61E+01	3.67E+00	6.78E+00	3.61E+01	3.67E+00	6.78E+00	4.39E+01	2.20E+01	2.00E+00	8.05E+01	4.44E+00	2.00E+00	4.53E+02	6.78E+01	6.74E+01	3.70E+01	4.98E+00	4.36E+01
Phosphate	4.82E+00	5.32E-01	1.07E+02	4.82E+00	5.32E-01	1.07E+02	1.73E+02	9.66E-01	1.00E+00	—	—	1.00E+00	7.57E-01	1.58E-01	3.44E+00	5.93E+00	5.35E-01	6.62E+00
Sb	9.02E-01	1.98E-01	1.30E+00	9.02E-01	1.98E-01	1.30E+00	1.94E-01	1.63E-01	2.00E+00	2.80E+00	3.21E-01	2.00E+00	1.15E+01	6.53E+00	1.14E+00	9.17E-01	3.41E-01	1.56E+00
Se	3.21E-01	7.99E-02	4.98E+00	3.21E-01	7.99E-02	4.98E+00	5.92E-02	3.59E-02	2.00E+00	1.43E+00	1.45E-01	2.00E+00	3.37E+00	1.75E+00	1.17E+00	3.26E-01	1.09E-01	4.93E-01
Si	1.23E+04	2.03E+03	2.55E+02	1.23E+04	2.03E+03	2.55E+02	—	—	2.00E+00	—	—	1.00E+00	7.06E+04	2.94E+04	2.15E+01	1.23E+04	2.38E+03	1.54E+04
Sn	1.86E+00	1.84E-01	1	1.86E+00	1.84E-01	1.00E+00	—	—	2.00E+00	—	—	1.00E+00	2.52E+01	3.90E+00	3.52E+01	1.89E+00	2.47E-01	2.29E+00
Sulfate	4.64E+01	1.46E+01	6.35E+00	4.64E+01	1.46E+01	6.35E+00	1.31E+02	5.36E+00	1.00E+00	—	—	1.00E+00	3.60E+01	5.13E+00	1.39E+02	4.70E+01	1.46E+01	6.80E+01
Tl	2.16E+00	6.04E-01	4.73E+00	2.16E+00	6.04E-01	4.73E+00	3.47E-03	3.62E-03	2.00E+00	1.50E+00	2.31E-01	2.00E+00	5.56E+00	1.09E+00	4.23E+00	2.15E+00	6.04E-01	3.08E+00
V	3.04E-01	3.63E-02	9.29E+00	3.04E-01	3.63E-02	9.29E+00	1.67E+00	1.17E+00	2.00E+00	1.35E+01	3.71E-01	2.00E+00	4.89E+00	8.93E-01	6.33E+00	3.27E-01	1.09E-01	5.05E-01
Zn	2.06E+02	3.34E+01	6.91E+00	2.06E+02	3.34E+01	6.91E+00	9.92E+00	4.83E+00	2.00E+00	1.02E+03	8.52E+01	2.00E+00	1.40E+03	2.02E+02	1.34E+02	2.07E+02	3.44E+01	2.55E+02
1,1 -dichloroethylene	3.02E+00	1.45E+00	1.10E+00	3.02E+00	1.45E+00	1.10E+00	3.21E+00	5.91E+00	1.00E+00	1.28E+00	1.76E-01	5.00E+00	9.83E+01	5.00E+01	1.17E+00	3.19E+00	2.61E+00	8.12E+00
1,1,2,2-tetrachloroethane	3.02E+00	1.45E+00	1.10E+00	3.02E+00	1.45E+00	1.10E+00	2.97E-01	5.01E-01	1.00E+00	1	—	1	9.83E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	8.01E+00
1,1,2-trichloroethane	3.01E+00	1.45E+00	1.10E+00	3.01E+00	1.45E+00	1.10E+00	2.87E-01	3.61E-01	1.00E+00	4.60E-02	1.33E-02	5.00E+00	9.81E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	8.00E+00
1,1-dichloroethane	1.34E+00	6.04E-01	1.12E+00	1.34E+00	6.04E-01	1.12E+00	8.84E-01	1.07E+00	1.00E+00	1.93E-02	8.50E-04	5.00E+00	4.08E+01	2.08E+01	1.17E+00	1.41E+00	1.07E+00	3.43E+00
1,2,4-trichlorobenzene	1.05E+01	2.29E+00	7.54E+00	1.05E+01	2.29E+00	7.54E+00	—	—	1	—	—	1	9.75E+00	2.98E+00	6.15E+00	1.05E+01	2.28E+00	1.37E+01
1,2-dichlorobenzene	7.92E+00	1.51E+00	1.31E+01	7.92E+00	1.51E+00	1.31E+01	—	—	1.00E+00	—	—	1	1.06E+02	3.27E+01	6.20E+00	8.04E+00	2.05E+00	1.08E+01
1,2-dichloroethane	6.16E+00	3.01E+00	1.10E+00	6.16E+00	3.01E+00	1.10E+00	—	—	1.00E+00	—	—	1	2.05E+02	1.04E+02	1.17E+00	6.47E+00	5.34E+00	1.66E+01
1,2-dichloropropane	6.12E+00	3.01E+00	1.10E+00	6.12E+00	3.01E+00	1.10E+00	—	—	1.00E+00	—	—	1	2.04E+02	1.04E+02	1.17E+00	6.43E+00	5.34E+00	1.65E+01
1,3-dichlorobenzene	1.04E+01	2.29E+00	7.53E+00	1.04E+01	2.29E+00	7.53E+00	—	—	1.00E+00	—	—	1	4.88E+00	1.49E+00	6.15E+00	1.03E+01	2.28E+00	1.35E+01
1,4-dichlorobenzene	1.10E+01	2.30E+00	7.68E+00	1.10E+01	2.30E+00	7.68E+00	—	—	1.00E+00	—	—	1	2.74E+01	8.39E+00	6.16E+00	1.10E+01	2.32E+00	1.42E+01

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V-Tanks				V-Tanks Samples				ARA-16			OU 1-07B			TAN-616 to V1, V2, V3, V9				Overall			
Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	90% UCL (mg/kg)
5.56E+01	1.19E+01	9.00E+00	5.56E+01	1.19E+01	9.00E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	2.42E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.39E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.29E+01	2.40E+00	8.93E+00	1.29E+01	2.40E+00	8.93E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	8.91E+01	2.57E+01	5.29E+00	1.29E+01	2.63E+00	1.22E+01	1.65E+01
3.97E+01	8.49E+00	9.54E+00	3.97E+01	8.49E+00	9.54E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	2.42E+02	1.47E+02	1.64E+00	3.98E+01	1.05E+01	8.35E+00	5.45E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.81E+01	9.03E+00	1.10E+00	1.81E+01	9.03E+00	1.10E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	6.12E+02	3.12E+02	1.17E+00	1.90E+01	1.60E+01	2.04E+00	4.93E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.21E+01	6.02E+00	1.10E+00	1.21E+01	6.02E+00	1.10E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.08E+02	2.08E+02	1.17E+00	1.27E+01	1.07E+01	2.04E+00	3.29E+01
4.22E+00	8.68E-01	7.12E+00	4.22E+00	8.68E-01	7.12E+00	1.65E-01	7.71E-02	2.00E+00	—	—	1	—	—	2.00E+00	3.53E+01	1.03E+01	5.51E+00	4.25E+00	9.68E-01	1.04E+01	5.57E+00
1.51E+01	2.65E+00	1.13E+01	1.51E+01	2.65E+00	1.13E+01	3.30E-02	4.28E-02	2.00E+00	—	—	1	—	—	2.00E+00	1.67E+02	4.79E+01	5.26E+00	1.53E+01	3.33E+00	1.64E+01	1.98E+01
5.56E+01	1.19E+01	9.00E+00	5.56E+01	1.19E+01	9.00E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	2.42E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.39E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
5.56E+01	1.19E+01	9.00E+00	5.56E+01	1.19E+01	9.00E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	2.42E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.39E+01
5.56E+01	1.19E+01	9.00E+00	5.56E+01	1.19E+01	9.00E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	2.42E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.39E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
3.37E+01	1.69E+01	1.10E+00	3.37E+01	1.69E+01	1.10E+00	3.81E+02	2.28E+02	5.00E+00	—	—	1	—	—	5.00E+00	1.14E+03	5.83E+02	1.17E+00	3.56E+01	3.03E+01	2.13E+00	9.27E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
—	—	1.00E+00	—	—	1.00E+00	3.97E+00	6.17E-01	2.00E+00	—	—	1	—	—	2.00E+00	—	—	1.00E+00	1.57E-03	1.23E-02	2.00E+00	2.47E-02
1.80E+01	1.83E+00	1.42E+01	1.80E+01	1.83E+00	1.42E+01	5.08E+00	3.45E+00	.00E+00	—	—	1	—	—	2.00E+00	9.59E+01	2.88E+01	5.99E+00	1.80E+01	2.21E+00	2.09E+01	2.10E+01
6.11E+00	3.01E+00	1.10E+00	6.11E+00	3.01E+00	1.10E+00	4.27E+00	8.74E-01	2.00E+00	—	—	1	—	—	2.00E+00	2.04E+02	1.04E+02	1.17E+00	6.42E+00	5.34E+00	2.04E+00	1.65E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	3.17E-02	4.11E-02	2.00E+00	—	—	1	—	—	2.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
5.57E+01	1.19E+01	9.00E+00	5.57E+01	1.19E+01	9.00E+00	9.34E-04	4.83E-04	2.00E+00	—	—	1	—	—	2.00E+00	2.43E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.40E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.73E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
4.54E+02	5.38E+01	1.08E+01	4.54E+02	5.38E+01	1.08E+01	1.03E+02	3.09E+01	2.00E+00	—	—	1	—	—	2.00E+00	3.45E+02	1.02E+02	5.82E+00	4.51E+02	5.38E+01	1.11E+01	5.25E+02
3.03E+00	1.45E+00	1.10E+00	3.03E+00	1.45E+00	1.10E+00	—	—	1.00E+00	—	—	1	—	—	1.00E+00	9.85E+01	5.00E+01	1.17E+00	3.18E+00	2.57E+00	2.04E+00	8.02E+00

ENGINEERING DESIGN FILE

Constituent	V-Tanks			V-Tanks Samples			ARA-16			OU 11-07B			TAN-616 to V1, V2, V3, V9			Overall			
	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	90% UCL (mg/kg)
bromoform	1.21E+01	6.02E+00	1.10E+00	1.21E+01	6.02E+00	1.10E+00	—	—	1.00E+00	—	—	1	4.09E+02	2.08E+02	1.17E+00	1.28E+01	1.07E+01	2.04E+00	3.29E+01
bromomethane	3.24E+00	4.15E-01	9.15E+00	3.24E+00	4.15E-01	9.15E+00	—	—	1.00E+00	—	—	1	1.06E+02	1.69E+01	1.84E+01	3.40E+00	8.29E-01	2.67E+01	4.49E+00
butylbenzylphthalate	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
carbon disulfide	3.03E+00	1.45E+00	1.10E+00	3.03E+00	1.45E+00	1.10E+00	—	—	1.00E+00	3.50E-02	7.45E-03	5.00E+00	9.87E+01	5.00E+01	1.17E+00	3.18E+00	2.57E+00	2.04E+00	8.02E+00
carbon tetrachloride	3.02E+00	1.45E+00	1.10E+00	3.02E+00	1.45E+00	1.10E+00	—	—	1.00E+00	—	—	1	9.83E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	2.04E+00	8.01E+00
carbozole	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
chlorobenzene	3.01E+00	1.45E+00	1.10E+00	3.01E+00	1.45E+00	1.10E+00	—	—	1.00E+00	4.43E-02	2.66E-03	5.00E+00	9.81E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	2.04E+00	8.00E+00
chloroethane	6.11E+00	3.01E+00	1.10E+00	6.11E+00	3.01E+00	1.10E+00	—	—	1.00E+00	—	—	1	2.04E+02	1.04E+02	1.17E+00	6.42E+00	5.34E+00	2.04E+00	1.65E+01
chloroform	3.01E+00	1.45E+00	1.10E+00	3.01E+00	1.45E+00	1.10E+00	—	—	1.00E+00	—	—	1	9.81E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	2.04E+00	8.00E+00
chloromethane	1.79E+00	3.10E-01	2.49E+00	1.79E+00	3.10E-01	2.49E+00	—	—	1.00E+00	—	—	1	5.64E+01	1.16E+01	3.58E+00	1.88E+00	5.81E-01	5.70E+00	2.73E+00
chrysene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
cis-1,2-dichloroethylene	2.82E+00	1.33E+00	1.11E+00	2.82E+00	1.33E+00	1.11E+00	1.35E-01	1.68E-01	1.00E+00	2.15E+02	8.48E-01	5.00E+00	9.15E+01	4.59E+01	1.18E+00	3.05E+00	2.90E+00	4.31E+00	7.49E+00
cis-1,3-dichloropropylene	3.04E+00	1.45E+00	1.10E+00	3.04E+00	1.45E+00	1.10E+00	—	—	1.00E+00	—	—	1	9.89E+01	5.00E+01	1.17E+00	3.19E+00	2.57E+00	2.04E+00	8.03E+00
dibenz(a,h)anthracene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	3.96E-02	5.14E-02	2.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
dibenzofuran	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
dibromochloromethane	3.04E+00	1.45E+00	1.10E+00	3.04E+00	1.45E+00	1.10E+00	—	—	1.00E+00	—	—	1	9.91E+01	5.00E+01	1.18E+00	3.20E+00	2.57E+00	2.04E+00	8.04E+00
diethylphthalate	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
dimethylphthalate	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
di-n-butylphthalate	1.04E+01	2.29E+00	7.53E+00	1.04E+01	2.29E+00	7.53E+00	1.47E+01	9.87E+00	2.00E+00	—	—	1	4.71E+00	1.40E+00	5.80E+00	1.04E+01	2.42E+00	9.26E+00	1.37E+01
di-n-octylphthalate	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	1.98E+00	2.57E+00	2.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.72E+00	1.06E+01	1.54E+01
ethylbenzene	3.02E+00	1.45E+00	1.10E+00	3.02E+00	1.45E+00	1.10E+00	3.03E-01	5.91E-01	1.00E+00	1.40E-01	1.41E-02	5.00E+00	9.83E+01	5.00E+01	1.17E+00	3.17E+00	2.57E+00	2.04E+00	8.01E+00
fluoranthene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
fluorene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
hexachlorobenzene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
hexachlorobutadiene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
hexachlorocyclopentadiene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
hexachloroethane	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
indeno(1,2,3-cd)pyrene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
isophorone	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
methylene chloride	6.36E+00	3.01E+00	1.10E+00	6.36E+00	3.01E+00	1.10E+00	—	—	1.00E+00	1.40E+02	8.76E+01	5.00E+00	2.12E+02	1.04E+02	1.18E+00	6.74E+00	5.63E+00	2.50E+00	1.73E+01
naphthalene	9.99E+00	2.17E+00	6.54E+00	9.99E+00	2.17E+00	6.54E+00	1.32E-01	5.14E-02	2.00E+00	—	—	1	1.38E+01	4.09E+00	5.82E+00	9.92E+00	2.17E+00	6.68E+00	1.30E+01
nitrobenzene	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
N-nitroso-di-n-propylamine	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	5.61E-02	7.28E-02	2.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
N-nitrosodiphenylamine	1.16E+01	2.44E+00	8.90E+00	1.16E+01	2.44E+00	8.90E+00	—	—	1.00E+00	—	—	1	4.71E+01	2.86E+01	1.63E+00	1.16E+01	2.71E+00	1.04E+01	1.53E+01
PCE	1.18E+02	1.84E+01	1.19E+00	1.18E+02	1.84E+01	1.19E+00	5.19E-01	1.00E+00	1.00E+00	3.07E+02	1.52E+02	5.00E+00	4.28E+02	8.25E+01	4.66E+00	1.18E+02	1.89E+01	1.36E+00	1.76E+02
pentachlorophenol	5.56E+01	1.19E+01	9.00E+00	5.56E+01	1.19E+01	9.00E+00	—	—	1.00E+00	—	—	1	2.42E+02	1.47E+02	1.64E+00	5.56E+01	1.34E+01	1.04E+01	7.39E+01
phenanthrene	1.04E+01	2.29E+00	7.53E+00	1.04E+01	2.29E+00	7.53E+00	1.45E-01	1.97E-01	2.00E+00	—	—	1	6.73E+00	1.96E+00	5.54E+00	1.04E+01	2.28E+00	7.61E+00	1.36E+01
phenol	1.09E+01	2.30E+00	7.63E+00	1.09E+01	2.30E+00	7.63E+00	5.67E-02	8.92E-02	1.00E+00	—	—	1	2.34E+01	6.74E+00	5.31E+00	1.09E+01	2.30E+00	7.93E+00	1.41E+01
pyrene	1.10E+01	2.41E+00	8.61E+00	1.10E+01	2.41E+00	8.61E+00	—	—	1.00E+00	—	—	1	4.7						

Constituent	V-Tanks			V-Tanks Samples			ARA-16			OU 1-07B			TAN-616 to V1, V2, V3, V9			Overall			
	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	Average (mg/kg)	St. Error (mg/kg)	DF	90% UCL (mg/kg)
trans-1,2-dichloroethylene	2.41E+00	1.06E+00	1.11E+00	2.41E+00	1.06E+00	1.11E+00	1.59E+00	3.08E+00	1.00E+00	3.58E+00	7.08E-01	5.00E+00	7.22E+01	3.67E+01	1.17E+00	2.54E+00	1.90E+00	2.12E+00	6.12E+00
trans-1,3-dichloropropylene	6.06E+00	3.01E+00	1.10E+00	6.06E+00	3.01E+00	1.10E+00	—	—	1.00E+00	—	—	1	2.02E+02	1.04E+02	1.17E+00	6.37E+00	5.34E+00	2.04E+00	1.64E+01
vinyl chloride	3.03E+00	1.45E+00	1.10E+00	3.03E+00	1.45E+00	1.10E+00	—	—	1.00E+00	9.50E-01	1.32E-01	5.00E+00	9.87E+01	5.00E+01	1.17E+00	3.19E+00	2.57E+00	2.04E+00	8.02E+00
xylene	3.04E+00	1.45E+00	1.10E+00	3.04E+00	1.45E+00	1.10E+00	1.66E+00	2.56E+00	1.00E+00	1.90E-01	1.47E-02	5.00E+00	9.89E+01	5.00E+01	1.17E+00	3.20E+00	2.57E+00	2.07E+00	8.06E+00
Ag-108m	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)	(nCi/g)
Ag-110m	1.09E-01	2.65E-02	1.27E+01	1.09E-01	2.65E-02	1.27E+01	3.06E-01	4.53E-01	2.00E+00	0.00E+00	0.00E+00	1	0.00E+00	0.00E+00	1.00E+00	1.10E-01	4.54E-02	4.37E+00	1.80E-01
Am-241	1.91E-01	5.27E-02	1.20E+01	1.91E-01	5.27E-02	1.20E+01	0.00E+00	0.00E+00	1.00E+00	3.43E-04	9.68E-05	5.00E+00	4.01E+00	7.99E-01	4.11E+00	1.16E+00	2.04E-01	1.52E+01	2.60E-01
Ce-144	1.14E+00	1.89E-01	1.18E+01	1.14E+00	1.89E-01	1.18E+01	2.16E+00	8.74E-01	2.00E+00	—	—	5.00E+00	—	—	1.00E+00	1.30E+00	3.87E-01	9.76E+00	1.43E+00
Cm-242	1.31E+00	3.89E-01	9.68E+00	1.31E+00	3.89E-01	9.68E+00	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	4.49E-03	1.00E-03	1.23E+01	1.84E+00
Cm-243/244	4.54E-03	1.01E-03	1.22E+01	4.54E-03	1.01E-03	1.22E+01	—	—	1.00E+00	—	—	1.00E+00	4.64E-01	1.20E-01	2.04E+00	2.90E-01	5.64E-02	1.26E+01	5.85E-03
Co-58	2.91E-01	5.64E-02	1.23E+01	2.91E-01	5.64E-02	1.23E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.92E-01	5.44E-02	1.32E+01	3.66E-01
Co-60	1.94E-01	5.46E-02	1.31E+01	1.94E-01	5.46E-02	1.31E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.92E-01	5.44E-02	1.32E+01	2.65E-01
Cs-134	4.64E+01	8.05E+00	5.03E+00	4.64E+01	8.05E+00	5.03E+00	1.34E+01	1.61E+01	2.00E+00	8.39E-01	1.68E-02	2.00E+00	7.55E+02	2.04E+02	1.91E+00	4.75E+01	1.19E+01	5.27E+00	6.51E+01
Cs-137	1.34E-01	2.75E-02	1.18E+01	1.34E-01	2.75E-02	1.18E+01	2.25E+00	1.02E+00	2.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.48E-01	8.77E-02	2.03E+00	7.79E-01
Eu-152	9.88E+02	1.16E+02	1.66E+01	9.88E+02	1.16E+02	1.66E+01	7.98E+02	3.06E+02	2.00E+00	7.08E+00	9.36E-01	2.00E+00	4.48E+03	8.92E+02	4.13E+00	9.92E+02	1.24E+02	1.66E+01	1.18E+03
Eu-154	2.37E+00	4.98E-01	1.08E+01	2.37E+00	4.98E-01	1.08E+01	1.42E+00	6.98E-01	2.00E+00	—	—	1.00E+00	1.14E-04	1.71E-05	2.44E+02	2.36E+00	4.99E-01	1.12E+01	3.04E+00
Eu-154	4.08E+00	5.28E-01	1.07E+01	4.08E+00	5.28E-01	1.07E+01	3.84E-01	4.18E-01	2.00E+00	2.73E-03	1.37E-03	2.00E+00	1.78E+01	9.24E+00	1.17E+00	4.08E+00	6.57E-01	6.80E+00	5.03E+00
Eu-155	4.57E-01	6.43E-02	1.64E+01	4.57E-01	6.43E-02	1.64E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	4.53E-01	6.40E-02	1.65E+01	5.39E-01
I-129	7.57E-03	1.94E-03	1.22E+01	7.57E-03	1.94E-03	1.22E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	7.50E-03	1.94E-03	1.23E+01	1.01E-02
Mn-54	7.00E-02	1.95E-02	1.31E+01	7.00E-02	1.95E-02	1.31E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	6.94E-02	1.95E-02	1.32E+01	9.56E-02
Nb-95	3.45E-01	1.65E-01	9.19E+00	3.45E-01	1.65E-01	9.19E+00	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	3.42E-01	1.64E-01	9.27E+00	5.68E-01
Ni-63	1.22E+02	2.46E+01	1.52E+01	1.22E+02	2.46E+01	1.52E+01	—	—	1.00E+00	2.69E+01	1.18E+01	2.00E+00	—	—	1.00E+00	1.21E+02	2.45E+01	1.53E+01	1.53E+02
Np-237	3.72E-03	8.02E-04	8.34E+00	3.72E-03	8.02E-04	8.34E+00	—	—	1.00E+00	—	—	1.00E+00	2.41E-02	4.18E-03	8.89E+00	3.73E-03	8.18E-04	9.24E+00	4.86E-03
Pu-238	1.89E+00	2.80E-01	3.59E+00	1.89E+00	2.80E-01	3.59E+00	1.49E+00	1.06E+00	2.00E+00	2.50E-03	3.64E-04	2.00E+00	1.61E+01	7.22E+00	1.24E+00	1.92E+00	4.23E-01	3.62E+00	2.61E+00
Pu-239/240	9.53E-01	9.49E-02	2.47E+01	9.53E-01	9.49E-02	2.47E+01	1.52E+00	9.39E-01	2.00E+00	6.24E-03	1.25E-04	2.00E+00	5.84E+00	8.34E-01	1.40E+02	9.66E-01	1.29E-01	1.15E+01	1.15E+00
Ra-226	2.35E-01	1.22E-01	7.16E+00	2.35E-01	1.22E-01	7.16E+00	—	—	1.00E+00	8.31E-04	3.39E-04	2.00E+00	—	—	1.00E+00	2.33E-01	1.21E-01	7.22E+00	4.04E-01
Ru-103	1.69E+00	4.69E-01	1.23E+01	1.69E+00	4.69E-01	1.23E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.68E+00	4.67E-01	1.24E+01	2.31E+00
Ru-106	1.42E+00	3.79E-01	1.29E+01	1.42E+00	3.79E-01	1.29E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.41E+00	3.77E-01	1.30E+01	1.92E+00
Sb-125	5.70E-01	1.55E-01	1.24E+01	5.70E-01	1.55E-01	1.24E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	5.65E-01	1.54E-01	1.25E+01	7.74E-01
Sr-90	1.84E+03	3.59E+02	6.03E+00	1.84E+03	3.59E+02	6.03E+00	3.71E+01	1.40E+01	2.00E+00	2.54E+00	1.68E+00	2.00E+00	5.18E+03	9.06E+02	8.15E+00	1.84E+03	3.59E+02	6.22E+00	2.36E+03
U-233/234	6.22E-01	9.25E-02	4.25E+00	6.22E-01	9.25E-02	4.25E+00	2.34E+00	5.62E-01	2.00E+00	2.76E-01	1.40E-01	2.00E+00	8.62E+00	2.48E+00	1.75E+00	6.48E-01	1.47E-01	5.26E+00	8.65E-01
U-235	1.98E-02	3.08E-03	3.16E+00	1.98E-02	3.08E-03	3.16E+00	1.05E-02	1.68E-02	2.00E+00	9.18E-03	3.38E-03	5.00E+00	2.84E-01	8.78E-02	1.60E+00	2.03E-02	5.02E-03	4.24E+00	2.80E-02
U-238	1.05E-02	9.87E-04	2.08E+01	1.05E-02	9.87E-04	2.08E+01	3.06E-02	4.87E-02	2.00E+00	3.07E-03	9.43E-04	2.00E+00	6.45E-02	9.33E-03	1.24E+02	1.08E-02	4.11E-03	2.29E+00	1.85E-02
Zn-65	1.76E-01	4.89E-02	1.28E+01	1.76E-01	4.89E-02	1.28E+01	3.63E-01	1.37E-01	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	1.76E-01	4.99E-02	1.38E+01	2.44E-01
Zr-95	3.93E-01	1.19E-01	1.21E+01	3.93E-01	1.19E-01	1.21E+01	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	3.90E-01	1.18E-01	1.22E+01	5.50E-01
Tritium	2.56E+01	1.37E+00	3.10E+02	2.56E+01	1.37E+00	3.10E+02	2.75E+02	1.07E-1	2.00E+00	2.23E-02	3.42E-03	5.00E+00	2.16E+02	3.93E+00	1.00E-01	2.58E+01	1.40E+00	1.77E+02	2.76E+01
Th-228	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	8.89E-04	1.48E-04	2.00E+00	—	—	1.00E+00	3.52E-07	2.95E-06	2.00E+00	5.91E-06
Th-230	—	—	1.00E+00	—	—	1.00E+00	—	—	1.00E+00	9.53E-04	1.07E-04	2.00E+00	—	—	1.00E+00	3.77E-07	2.13E-06	2.00E+00	6.94E-06
K-40	—	—	1.00E+00	—	—	1.00E+00	8.84E-03	1.12E-03	2.00E+00	—	—	2.00E+00	—	—	1.00E+00	3.50E-06	2.23E-05	2.00E+00	4.56E-05